(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau





(43) International Publication Date 19 July 2001 (19.07,2001)

PCT

(10) International Publication Number WO 01/50866 A3

C12N 7/00, A61L 2/16, A23L 3/3571

(51) International Patent Classification7:

A01N 63/00.

(21) International Application Number: PCT/US01/00810

(22) International Filing Date: 11 January 2001 (11.01.2001)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

(71) Applicant (for all designated States except US): INTR-ALYTIX, INC. [US/US]: 351 West Camden Street. Suite 100, Baltimore, MD 21201 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): SULAKVELIDZE, Alexander [US/US]; 536 Hampton Lane. Baltimore. MD 21286 (US). MORRIS, J., Glenn, Jr. [US/US]; 107 St. Johns Road. Baltimore. MD 21210 (US). ALAVIDZE, Zemphira [GE/GE]: 22 Gotua Street. Apt. 74, Tbilisi, 380060 (GE). PASTERNACK, Gary, R. [US/US]; 311 Edgevale Road, Baltimore, MD 21212 (US). BROWN, Torrey, C. [US/US]: 440 Braewood Way, Severna Park, MD 21146 (US).

- (74) Agents: POSORSKE, Laurence, H. et al.: Intellectual Property Department. Brobeck. Phleger & Harrison LLP. 1333 H Street, N.W., Suite 800, Washington, DC (US).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW,
- (84) Designated States (regional): ARJPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

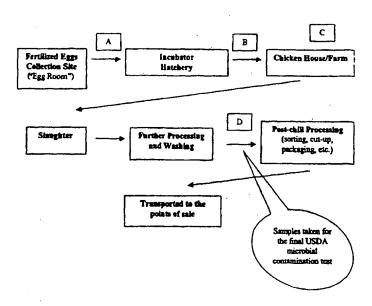
Published:

with international search report

(88) Date of publication of the international search report: 7 February 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND DEVICE FOR SANITATION USING BACTERIOPHAGES



(57) Abstract: Methods and devices for sanitation using bacteriophage аге disclosed. According to one embodiment of the present invention, a method for sanitation using at least one bacteriophage includes the steps of (1) storing the at least one bacteriophage in a container; and (2) applying the at least one bacteriophage to a surface to be sanitized with a dispersing mechanism. According to another embodiment of the present invention, a sanitation device that dispenses at least one bacteriophage includes a container, at least one bacteriophage stored in the container, and a dispersing mechanism that disperses the at least one bacteriophage from the container.

WO 01/50866 A3

. . . .

Interr anal Application No PCT/US 01/00810

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 A01N63/00 C12N C12N7/00 A61L2/16-- A23L3/3571 According to International Patent Classification (IPC) or to both national classification and IPC B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A01N C12N A61L A23L Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practical, search terms used) WPI Data, PAJ, FSTA, EPO-Internal, BIOSIS C. DOCUMENTS CONSIDERED TO BE RELEVANT Relevant to claim No. Citation of document, with indication, where appropriate, of the relevant passages Category * 1-18. EP 0 290 295 A (MICROBIAL DEV LTD) χ 20-239 November 1988 (1988-11-09) 40,42, 46-5157-62, 71 - 7477-79, 81-84,86 24-39 claims 1-8; examples 1-9 Υ page 4, line 16-60 page 2, line 3-26 41, page 3, line 8 -page 4, line Α 13-45, 11,16-40,52-56 52-56, 63 - 70. 75,76, 80.85-87 Patent family members are listed in annex. Further documents are listed in the continuation of box C. X " Special categories of cited documents: *T* later document published after the international tiling date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the "A" document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to titing date 'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) involve an inventive step when the document is taken alone document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such docu-*O* document reterring to an oral disclosure, use, exhibition or ments, such combination being obvious to a person skilled other means in the art. document published prior to the international filing date but *8" document member of the same patent family later than the priority date claimed Date of the actual completion of the international search Date of mailing of the international search report 0 6 11 2001 25 September 2001 Name and mailing address of the ISA Authorized officer European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl. Fax: (+31-70) 340-3016 Tallgren, A

Intern Conal Application No

C.(Continu	ation) DOCUMENTS CONSIDERED TO BE RELEVANT	PC1/US 01/	
Calegory "	Citation of document, with indication, where appropriate, of the relevant passages		Relevant to claim No
X	GB 2 253 859 A (MICROBIAL DEV LTD) 23 September 1992 (1992-09-23)		1-18, 20-23, 59, 71-79, 81-84
	claims 1,2,5,7,8,10; example 1 page 1, paragraphs 1-3,5 page 2, paragraph 3 -page 4, paragraph 4 page 5, paragraphs 2,4 -page 6, paragraph 4 page 7, paragraphs 2,3		24-70,80
	page 8, paragraph 2 		
Y	DE 37 14 699 A (BENZ WILLI DIPL ING) 7 January 1988 (1988-01-07) claims 1-4,6-9,12 column 2, line 65 -column 3, line 66		24-39
	US 5 641 464 A (BRIGGS III STEPHEN W ET AL) 24 June 1997 (1997-06-24) claims 1,2; figure 2 column 2, line 3-27 column 3, line 36-58		24-30, 36-39
(EP 0 414 304 A (UNILEVER NV; UNILEVER PLC (GB)) 27 February 1991 (1991-02-27) claims 1-5,7-12; examples 1-11 column 1, line 1-6,20-52 column 2, line 13 -column 3, line 44 column 3, line 2-53		1-18,20, 81-83
١	column 4, line 25-29		5,19-39, 87
	US 4 778 653 A (KAMIMURA KAZUO ET AL) 18 October 1988 (1988-10-18) claims 1,2; examples 1-3 column 1, line 10-17 column 2, line 29-52 column 3, line 31 -column 4, line 34		81,84, 86,87
	DATABASE WPI Section Ch, Week 198931 Derwent Publications Ltd., London, GB; Class A81, AN 1989-225630 XP002178311 & JP 01 163108 A (KANSAI DENRYOKU KK), 27 June 1989 (1989-06-27) abstract		81,84, 85,87
	-/		

Interr anal Application No PC1/US 01/00810

Category "	ation) DOCUMENTS CONSIDERED TO BE RELEVANT Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
category "	Change of document, with interestion, where appropriate, or the feeture passages	
х	DATABASE WPI Section Ch, Week 198806 Derwent Publications Ltd., London, GB; Class D15, AN 1988-039734 XP002178312 & JP 62 298498 A (AGENCY OF IND SCI & TECHNOLOGY), 25 December 1987 (1987-12-25) abstract	81,84,87
X	PATENT ABSTRACTS OF JAPAN vol. 011, no. 349 (C-456), 14 November 1987 (1987-11-14) & JP 62 123104 A (JAPAN TOBACCO INC), 4 June 1987 (1987-06-04) abstract	81,83,86
X	GREER G G: "HOMOLOGOUS BACTERIOPHAGE CONTROL OF PSEUDOMONAS GROWTH AND BEEF SPOILAGE" JOURNAL OF FOOD PROTECTION, vol. 49, no. 2, 1986, pages 104-109, XP001024459 ISSN: 0362-028X page 104, paragraph 1 -page 106, paragraph 4 page 107, paragraph 6 -page 109, paragraph 1	71-77,79
X	EP 0 510 907 A (AGRICULTURAL & FOOD RES) 28 October 1992 (1992-10-28) claims 1,4-7; example 2 page 2, line 12-35,49 -page 3, line 3,20-26	71-78
X	EP 0 403 292 A (MICROBIAL DEV LTD) 19 December 1990 (1990-12-19) claims 1-3,7; examples 1,2 page 2, line 39 -page 3, line 13 page 4, line 9-20,29-34	71-75,79
X	SMITH H W ET AL: "EFFECTIVENESS OF PHAGES IN TREATING EXPERIMENTAL ESCHERICHIA-COLI DIARRHEA IN CALVES PIGLETS AND LAMBS" JOURNAL OF GENERAL MICROBIOLOGY, vol. 129, no. 8, 1983, pages 2659-2676, XP001024375 ISSN: 0022-1287 cited in the application page 2659, paragraph 1 page 2660, paragraphs 1,3 -page 2661, paragraphs 1,2,4 page 2662, paragraph 1 page 2673, paragraph 2 tables 2,3,12-15	71,73,74,77
	-/	

Interr Conal Application No
PCI/US 01/00810

		PC1/US 01	1/00810
	ation) DOCUMENTS CONSIDERED TO BE RELEVANT		Determine the second
Calegory "	Citation of document, with indication, where appropriate, of the relevant passages		Relevant to claim No
X	DE 43 26 617 C (SCHERER SIEGFRIED UNIV PROF DR) 30 June 1994 (1994-06-30) column 1, line 12-17,41 -column 2, line 9; claim 1; example 1		71,81
X	BERCHIERI A JR ET AL: "THE ACTIVITY IN THE CHICKEN ALIMENTARY TRACT OF BACTERIOPHAGES LYTIC FOR SALMONELLA-TYPHIMURIUM" RESEARCH IN MICROBIOLOGY, vol. 142, no. 5, 1991, pages 541-550, XP001024374 ISSN: 0923-2508		43-45, 49-51, 71,72, 77,78
А	page 541, paragraphs 1,2 page 542, paragraph 4 page 543, paragraphs 2-7 page 544, paragraphs 1-3 tables 2-5 page 545, paragraph 1 -page 548, paragraph 3		40-42, 52-58
Р,Х	EP 0 970 613 A (MONFORT INC) 12 January 2000 (2000-01-12) claims 1-3,23-25 column 1, line 5-48 column 5, line 53 -column 9, line 19 column 10, line 5 -column 11, line 37		59-62, 67-85
A	column 15, line 8 -column 16, line 46		63-66
X	WO 98 47521 A (IDAHO RES FOUND ;BOHACH CAROLYN H (US); YOUDERIAN PHILIP A (US)) 29 October 1998 (1998-10-29) claims 1-6,16,19,22,24,26-29,31 page 12, line 4 -page 13, line 13 page 15, line 5-30		57,58, 71-74, 77-79, 81-83,85
X	WO 90 13631 A (JACKSON LE ROY E) 15 November 1990 (1990-11-15) claim 1; examples 2,3 page 2, line 29-33		81-86
A	WO 97 13405 A (US AGRICULTURE) 17 April 1997 (1997-04-17) claims 1-5,10; examples 1-3 page 5, paragraph 3 -page 6, paragraph 2 page 9, paragraph 2 -page 10, paragraph 2		40-58
A	WO 96 04364 A (UNIV GEORGIA ;US AGRICULTURE (US)) 15 February 1996 (1996-02-15) claims 1,3; examples 1-3 page 4, paragraph 3 -page 5, paragraph 1 page 6, paragraph 2 -page 7, paragraph 3		40-58
	-/		

Internitional Application No.
PC1/US 01/00810

C.(Continua	ation) DOCUMENTS CONSIDERED TO BE RELEVANT	
Calegory "	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
A	WO 98 54981 A (CALPIS CO LTD ;MARUTA KIYOSHI (JP); MIYAZAKI HIROSHI (JP)) 10 December 1998 (1998-12-10) claims 1,2,7-9; examples 1-5	40-58
A	WO 90 14765 A (US AGRICULTURE) 13 December 1990 (1990-12-13) claims 1-8,10,13-19; examples 1-4 page 2, line 24 -page 3, line 1 page 3, line 33 -page 4, line 19	40-58
	·	
	·	

ational application No. PCT/US 01/00810

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)
This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:
Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).
Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)
This International Searching Authority found multiple inventions in this international application, as follows:
see additional sheet As a result of the prior review under R. 40.2(e) PCT, no additional fees are to be refunded.
1. X As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
Remark on Protest X The additional search fees were accompanied by the applicant's protest. No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-39

A method for sanitation using at least one bacteriophage, comprising storing the at least one bacteriophage in a container and applying the at least one bacteriophage to a surface to be sanitized with a dispersing mechanism. The sanitation device comprising a container, at least one bacteriophage stored in the container and the dispersing mechanism.

2. Claims: 40-58

A method of poultry processing sanitation applying at least one bacteriophage.

3. Claims: 59-70

A method of foodstuff packaging comprising foodstuff, packaging material and applying bacteriophage either to the foodstuff or packaging material.

4. Claims: 71-80

A method for foodstuff sanitation providing a bacteriophage to the foodstuff.

5. Claims: 81-87

A method for decontamination using at least one bacteriophage comprising applying at least one bacteriophage to an area contaminated with at least one pathogenic bacteriophage.

aformation on patent family members

Inte tional Application No PC I/US 01/00810

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 0290295		09-11-1988	WO	0002122 41	05-04-1990
LI 0230233	А	09-11-1900	AT	9003122 A1 78991 T	
		•	DE	3873402 A1	15-08-1992
					10-09-199
			DE	3873402 T2	03-12-199
			DK	2 5 2588 A	08-11-1988
			EΡ	0290295 A2	09-11-1988
			ES	2051844 T3	01-07-1994
			FI	882129 A	08-11-1988
			GB	2206028 'A ,B	29-12-1988
			GR	3005371 T3	24-05-1993
			ΙE	62187 B	28-12-1994
			NO	882013 A	
					08-11-1988
			US	4851240 A	25-07-1989
			US 	5006347 A	09-04-1991
GB 2253859	A	23-09-1992	NONE		
DE 3714699	A	07-01-1988	DE	3714699 A1	07-01-1988
US 5641464	Α	24-06-1997	NONE		
EP 0414304	Α	27-02-1991	AU	637806 B2	10-06-1993
			AU	6110990 A	21-02-1991
			BR	9004130 A	03-09-1991
			CA	2023556 A1	22-02-1991
•			DE	69013812 D1	08-12-1994
		*	EP	0414304 A2	27-02-1991
•			ES		
				2065471 T3	16-02-1995
			JP.	2080412 C	09-08-1996
			JP	3118306 A	20-05-1991
			JP	7103005 B	08-11-1995
			ZA	9006621 A	29-04-1992
US 4778653	Α	18-10-1988	JP	1716858 C	14-12-1992
			JP	4009999 B	21-02-1992
			JP	60159596 A	21-08-1985
JP 1163108	А	27-06-1989	NONE		
JP 62298498	A	25-12-1987	NONE		
JP 62123104	 -	04-06-1987	JP	1755114 C	23-04-1993
			JP	4048762 B	07-08-1992
EP 0510907	- -	28-10-1992	GB	2255561 A	11-11-1992
			AU	650737 B2	30-06-1994
			AU	1502392 A	22-10-1992
			CA	2066387 A1	21-10-1992
			EP	0510907 A2	28-10-1992
			US	6083684 A	04-07-2000
			US 	5763251 A	09-06-1998
EP 0403292	A 	19-12-1990	EP	0403292 A2	19-12-1990
DE 4326617	C	30-06-1994	DE	4326617 C1	30-06-1994
	Α	12-01-2000	US	5374433 A	20-12-1994
P 0970613		12 01 2000	EP	0970613 A1	12-01-2000

nformation on patent family members

Intentional Application No
PC i /US 01/00810

Patent document cited in search report	_	Publication date		Patent family member(s)	Publication date
EP 0970613	A		AU	663898 B2	26-10-1995
LI 0970013	,,		AU	2909492 A	15-06-1993
			BR	9206794 A	31-10-1995
			CA	2123300 A1	27-05-1993
			DE	69231650 D1	22-02-2001
				69231650 T2	03-05-2001
			DE		05-07-1995
			EP	0660670 A1	•
			ES	2155440 T3	16-05-2001
			JP	7501218 T	09-02-1995
			ΜX	9206703 A1	30-06-1994
			NZ	244793 A	26-09-1995
			WO	9309676 A1	27-05-1993
			US	6039984 A	21-03-2000
			US	5576035 A	19-11-1996
			US	6287610 B1	11-09-2001
			US	5869113 A	09-02-1999
 WO 9847521	А	29-10-1998	AU	7113398 A	13-11-1998
WU 3047321			WO	9847521 A1	29-10-1998
WO 9013631	Α	15-11-1990	US	4828999 A	09-05-1989
			WO	9013631 A1	15-11-1990
WO 9713405	Α	17-04-1997	AU	7440796 A	30-04-1997
			WO	9713405 A1	17-04-1997
WO 9604364	A	15-02-1996	AU	3692395 A	04-03-1996
			CA	2196100 A1	15-02-1996
			EP	0801675 A1	22-10-1997
			WO	9604364 A1	15-02-1996
			US	6010695 A	04-01-2000
WO 9854981	Α	10-12-1998	JP	3028214 B2	04-04-2000
WO 7054701	•		JР	10330274 A	15-12-1998
			ĂU	7549298 A	21-12-1998
			BR	9809921 A	01-08-2000
		•	CN	1265564 T	06-09-2000
			EP	0987957 A1	29-03-2000
			WO	9854981 A1	10-12-1998
		 13-12-1990		5206015 A	27-04-1993
WO 9014765	Α	12-12-1990	US	633112 B2	21-01-1993
			UA		07-01-1991
			ΑU	5821790 A	
			DE	69032207 D1	07-05-1998
			DE	69032207 T2	13-08-1998
			EP	0476018 A1	25-03-1992
			ES	2113858 T3	16-05-1998
			JP	2571158 B2	16-01-1997
			JP	4503759 T	09-07-1992
			WO	9014765 A1	13-12-1990